

Photo credit: Perkins Eastman

Decision-making for the next decade:

What the new incentive and regulatory environments mean for school facility investments

October 19, 2023

Agenda for today

Part 1 - Inflation Reduction Act and utility incentives: What does every school construction team need to know

Part 2 - Future-proofing your HVAC: Smith College’s Geo-exchange System

Part 3 - Case study: Hopkinton’s Elmwood Elementary

Part 1 - Inflation Reduction Act and utility incentives: What every school construction team needs to know



Sara Ross

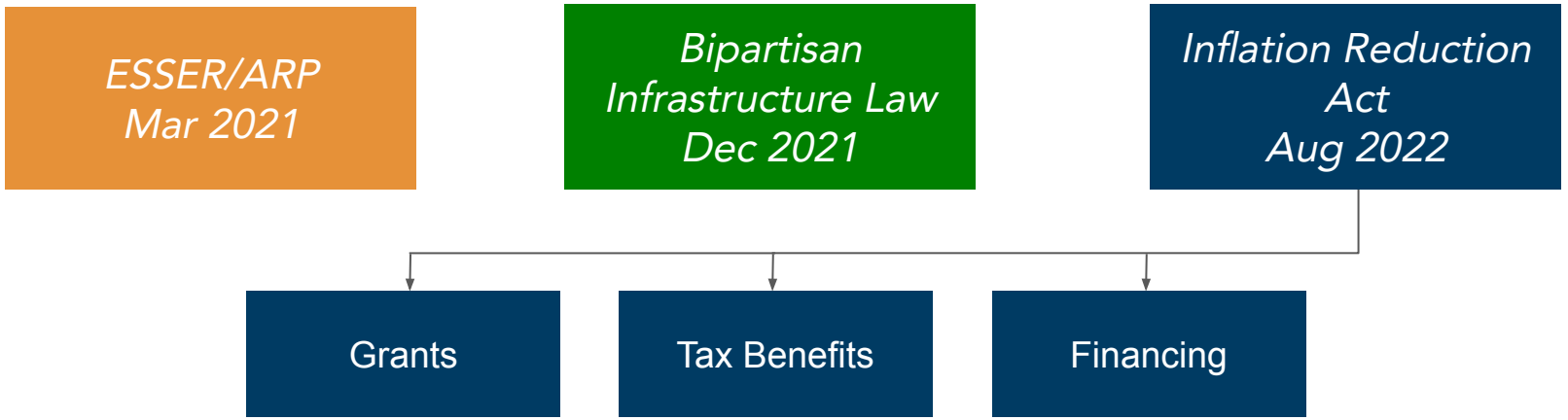


Kim Cullinane

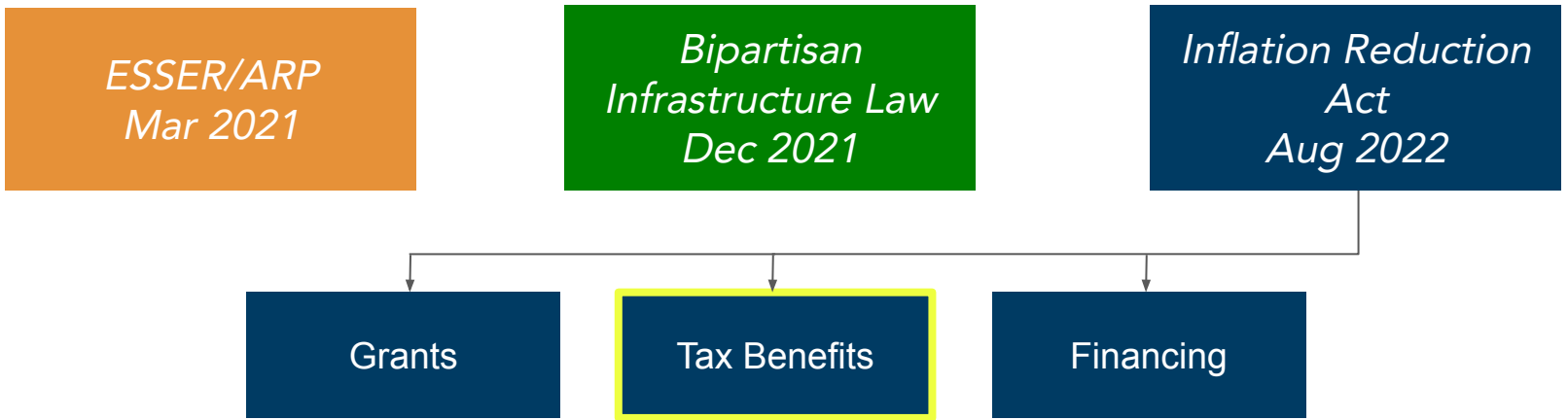
UNDAUNTED K12
Climate-resilient schools and future-ready students

EVERSOURCE

The context for IRA funding



Largest opportunity (available today) is the tax benefits



Tax credits available for this clean energy equipment

1. Solar energy



Source: Generation 180

2. Energy storage



Source: EnelX

3. Electric vehicles



4. EV charging equipment



5. Ground-source heat pumps



What's so special about the IRA's tax credits?

Non-competitive

Cash reimbursement

Available until 2033+

Unlimited funding

What is the amount of my credit?

Cost Basis $ x

Rate % x

Reduce for Tax-Exempt Financing % =

Value of IRA Tax Credit

Determining the cost basis. We have experience.

IRS Guidance
Notice 2018-59
“Geothermal Heat Pump Property - On-site physical work of a significant nature may include the installation of ground heat exchangers, heat pump units, or air delivery systems (ductwork).”

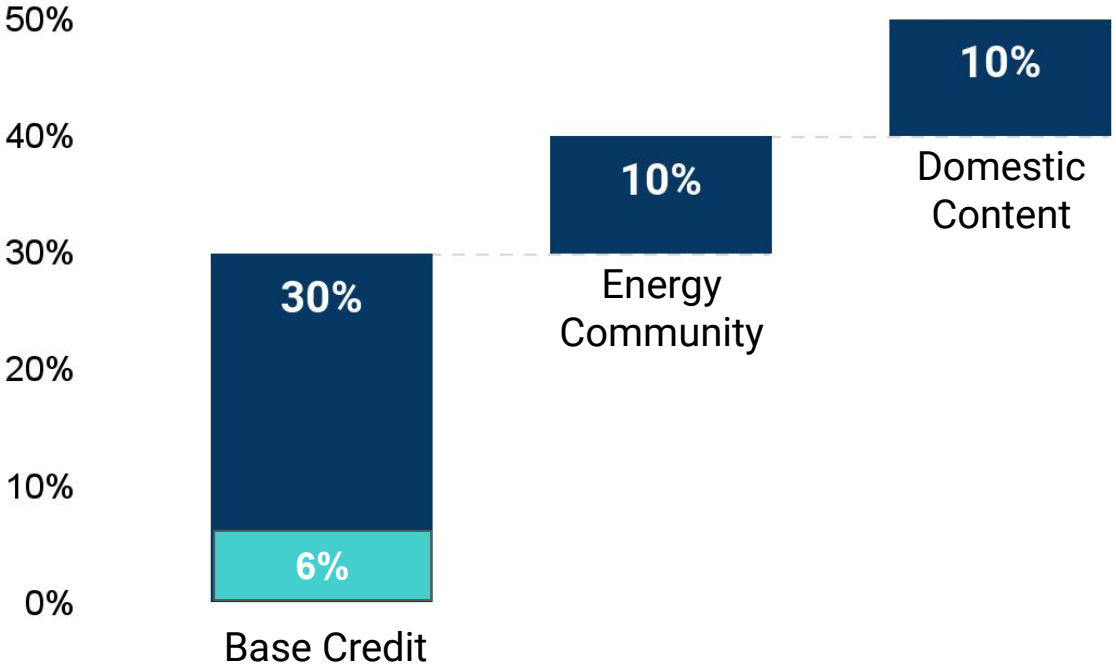
From Industry Association based on past experience of members:
Federal financial incentives include every part of the mechanical systems required to make a complete package including wells, distribution piping, electrical, controls, heat pump equipment, all required peripherals (pumps and VFD's, etc.) and labor.



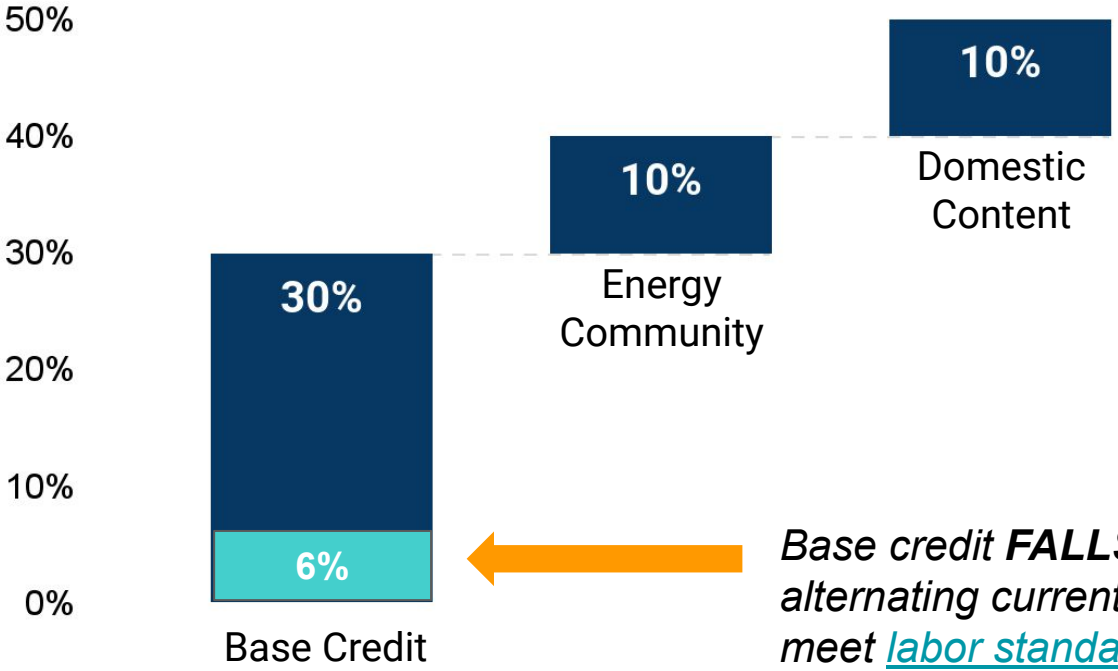
D20 - PLUMBING	$2,454,125
D30 - HVAC	$11,264,869
D50 - ELECTRICAL	$7,910,861

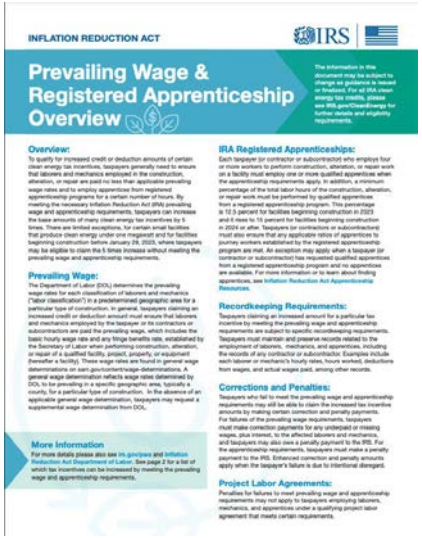
Determine relevant costs from HVAC, plumbing and electrical scopes based on past guidance and experience.

Understanding the project's rate. Bonus credits may apply.



Know the 1 MW test & implications for labor standards




INFLATION REDUCTION ACT

IRS

Prevailing Wage & Registered Apprenticeship Overview

Overview:

IRA Registered Apprenticeships:

Prevailing Wage:

Recordkeeping Requirements:

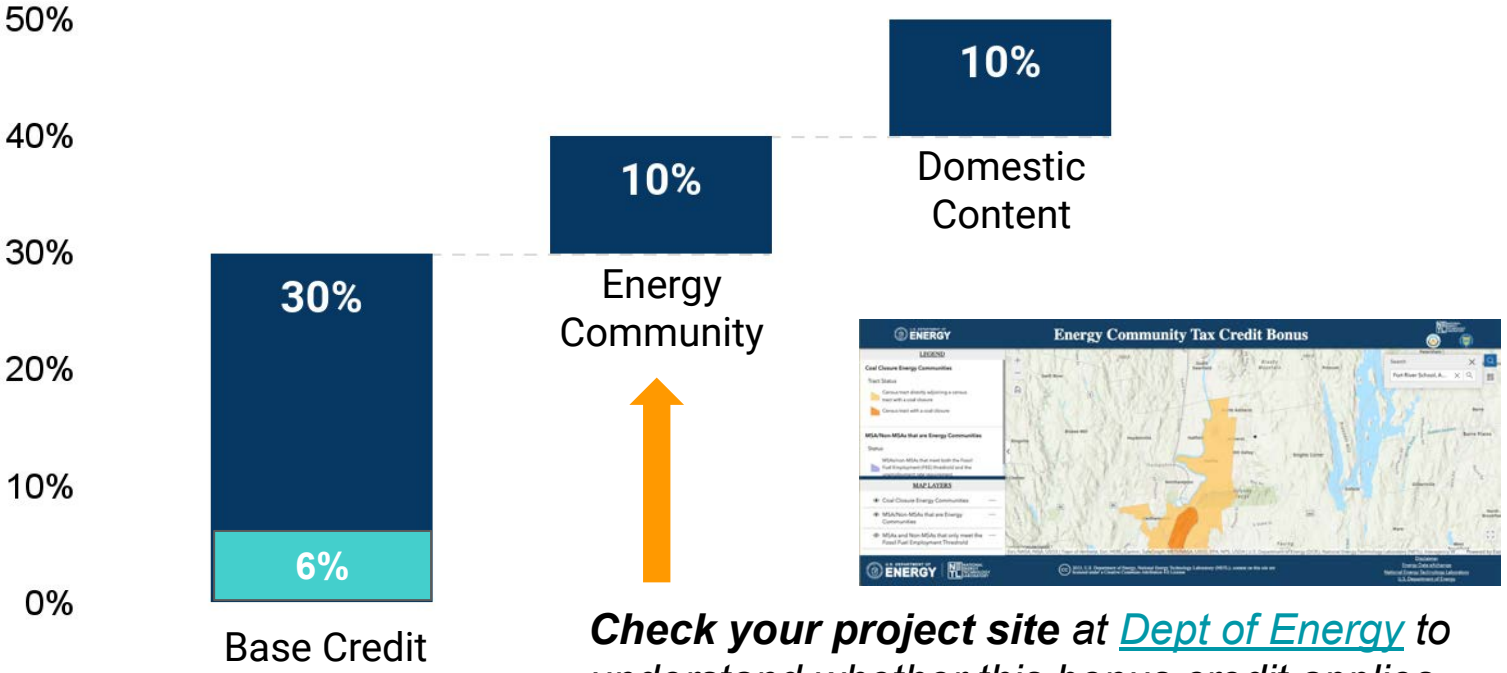
Corrections and Penalties:

More Information

Project Labor Agreements:

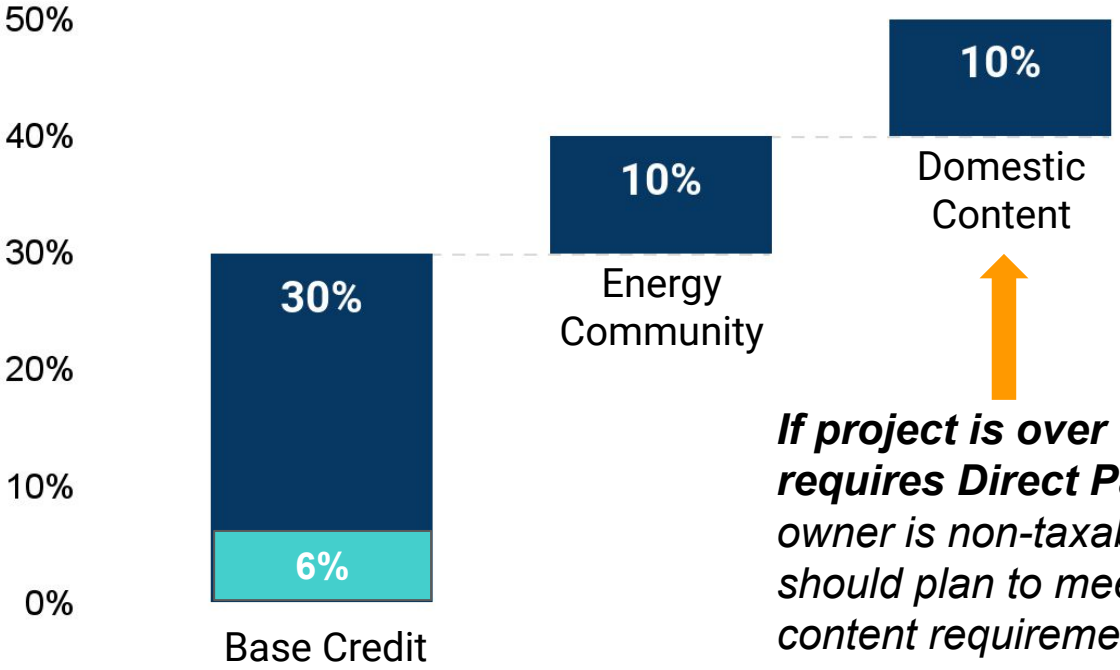
*Base credit **FALLS** to 6% if > 1 megawatt alternating current (MW ac) AND does **NOT** meet [labor standards]*

Check your site location for the “energy community” bonus



***Check your project site** at [Dept of Energy] to understand whether this bonus credit applies*

Domestic content will be critical if over 1 MW



If project is over 1MW and requires Direct Pay *(e.g. owner is non-taxable entity) should plan to meet domestic content requirements.*


BLUEGREEN ALLIANCE

Domestic Content Bonus for Clean Energy Tax Credits

A User Guide for Project Developers

Available here: https://www.bluegreenalliance.org/resources/bluegreen-alliance-domestic-content-user-guide/

Adjust the rate if using tax-exempt bonds

Example:

$$(30\% + 10\%) = 40\% \text{ less } 15\% = 34\%$$

Base credit; Domestic content adder; Tax-exempt bonds

"To the extent that a project is financed with tax-exempt debt and eligible for the PTC or ITC, the amount of the tax credit is reduced by the lesser of (i) 15% or (ii) the portion of the qualifying project that has been financed with tax-exempt debt. Because this is a "lesser of" test, this allows such projects to be financed 100% with tax-exempt debt, while only reducing the direct pay tax credit by 15%."

Source: JDSupra, "Inflation Reduction Act Levels Renewable Energy Playing Field for Tax-Exempt Entities" August 26, 2022

Estimated value of IRA tax benefits for a hypothetical K-12 school project

	Basis	x Rate	= Estimated value
Tax credit for ground-source heat pumps*	$11,264,869	34%	**$3,830,055**
Tax credit for solar	$2,310,000	25.5%	**$589,050**
Tax credit for energy storage	$500,000	25.5%	**$127,742**
Total estimated tax benefits			**$4,546,847**

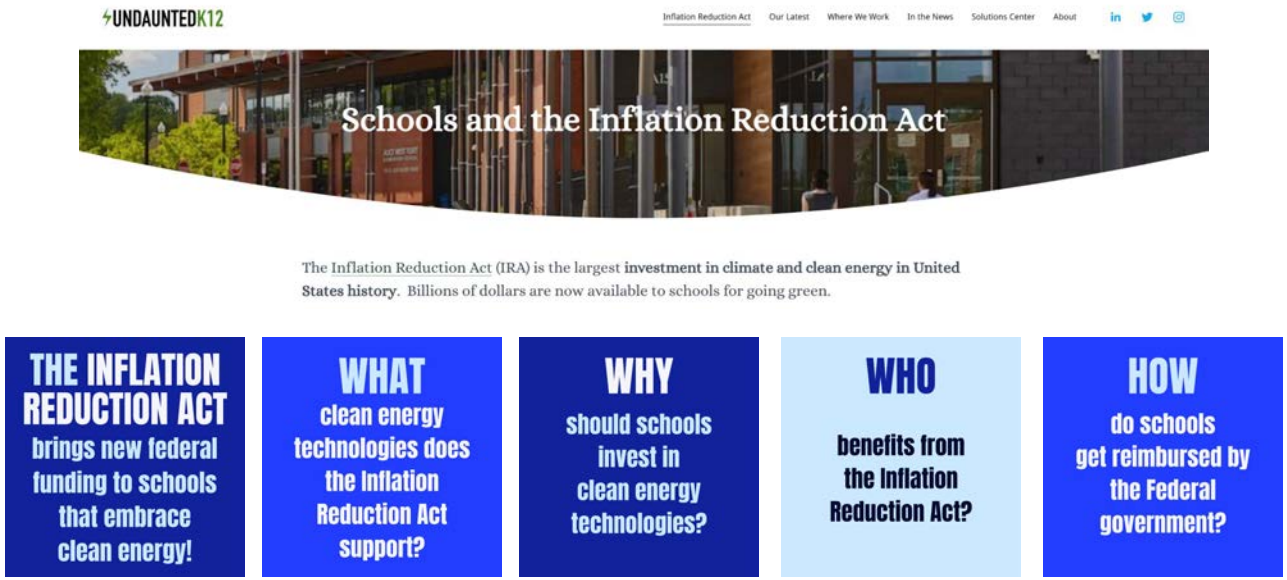
* This project assumes a 280-ton GSHP systems which converts to less than 1MW-ac so project is *exempt* from labor standards and needing to meet domestic content requirements for purposes of using Direct Pay. Regardless, project plans to meet domestic content for the GSHP system and to therefore collect the 10% adder.

MSBA policy change makes federal $ more valuable

	Before Policy Change	*After Policy change*
Initial cost basis	$100,000,000	$100,000,000
Third-party funding	$5,000,000	$5,000,000
Adjusted cost basis	$95,000,000	--
State share (%)	60%	60%
Local share (%)	40%	40%
State share ($)	$57,000,000	$60,000,000
Local share ($)	$38,000,000	$35,000,000
Net change to local share due to new policy		**-$3,000,000**

For more information, read the MSBA's memo about the new Third-Party Funding Policy here:
https://www.massschoolbuildings.org/sites/default/files/edit-contentfiles/About_Us/Board_Meetings/2023_Board/6.21.2023/UpdatedThirdPartyFundingPolicy6_21_2023.pdf

Check out our new web resources for more information!



https://www.undauntedk12.org/schools-and-the-ira

Want more on IRA and zero energy buildings? Watch these recorded sessions.

- Inflation Reduction Act
  https://youtu.be/BQJqiq6NyII
- Ground Source Heat Pumps
  https://youtu.be/QdN10otVBus
- Importance of Building Envelope in Net Zero
  https://youtu.be/pjI7WAL7F-s
- Eversource Outlook and Program Updates
  https://youtu.be/PssbifHIKTc



Commercial New Construction & Major Renovation Participation Pathways for K-12 Schools

WE ARE MASS SAVE®:

mass save

Together, we make good happen for Massachusetts.

Your local electric and natural gas utilities and energy efficiency service providers taking strides in energy efficiency: Berkshire Gas, Cape Light Compact, Eversource, Liberty Utilities, National Grid and Unitil.

As one, we form Mass Save®, with the common goal of helping residents and businesses across Massachusetts save money and energy, leading our state to a clean and energy efficient future.



WE ARE MASS SAVE®:

BERKSHIRE GAS An AVANGRID Company

Cape Light Compact

EVERSOURCE

Liberty

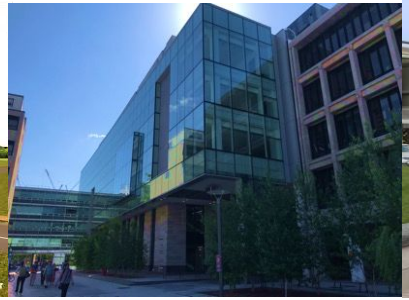
nationalgrid

Unitil

New Building/Major Renovation Participation Pathways

Path 1	Path 2	Path 3
Net Zero & Low EUI Buildings	Whole Building EUI Reduction	High Performance Buildings







Low EUI Pathways

Path 1: Net Zero & Low EUI Buildings

ACTON-BOXBOROUGH DOUGLAS-GATES ELEMENTARY SCHOOL
Opened Fall 2022 | All-electric



Intent: Focus On Performance

- Buildings must perform at EUI target after first year of occupancy to obtain full incentive

Key Program Drivers: EUI And Low Carbon

- Set an absolute energy use target – 25 EUI
- Work toward EUI target throughout design, construction and into first year of occupancy
- Decarbonize the building

Technical Assistance

- Net zero design support - up to $10,000
- Post occupancy verification Incentive - up to $10,000

Customer Incentives

Construction	Post Occupancy	Heat Pump Adder
Up to $2.00/sf	$1.50/sf	Air Source Heat Pumps: $800/ton Variable Refrigerant Flow (VRF): $1,200/ton Ground Source Heat Pumps: $4,500/ton

Example – New Elementary School

172,000 SF new building

Solar PV: $2 million

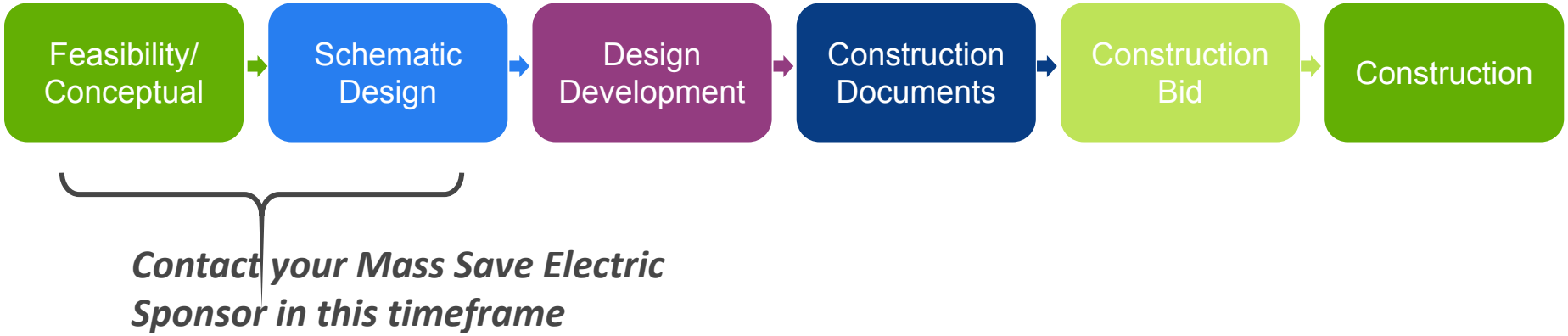
Geothermal: 340 tons, 110 wells at 600' depth: $20 million

Target site EUI: 25

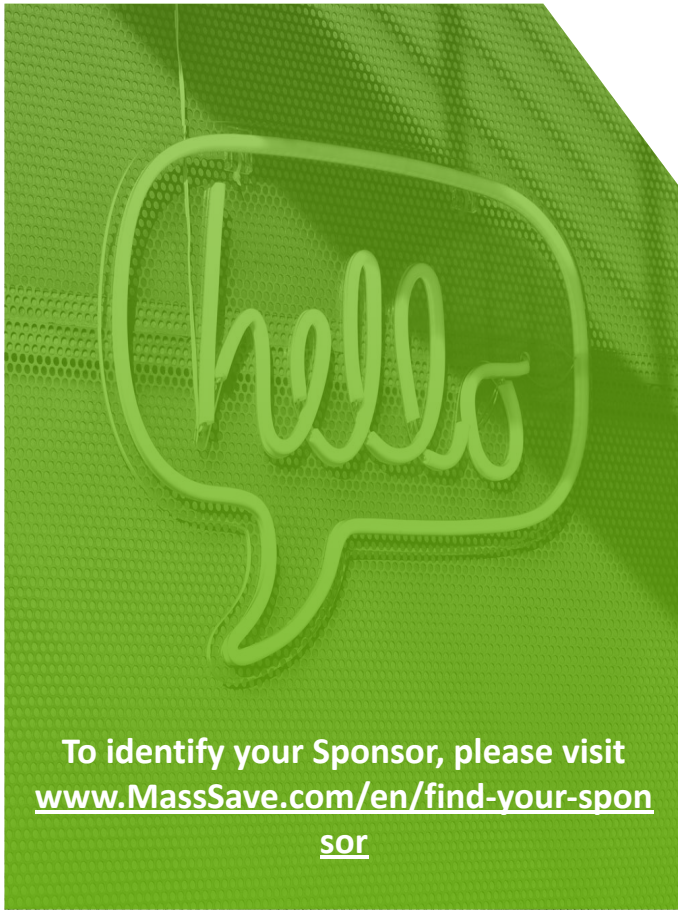
Path 1 Mass Save Incentives with 25 EUI Target	
$2.00 /SF Construction Incentive	$344,000
Electrification incentive for ground source heat pumps at $4,500/ton	$1,530,000
$1.50/SF Post Occupancy Incentive	$258,000
Total	**$2,132,000**

What Can You Do?

1. Add your low carbon, net zero, 25 EUI goals into your Request for Design Services
2. Engage Mass Save Sponsors on projects early in design
3. Start thinking about electrification of all end uses (e.g., heating, hot water, kitchen)
4. Look into IRA tax credits – consider hiring a tax attorney to assist



Mass Save New Construction/Major Renovation Contacts



To identify your Sponsor, please visit www.MassSave.com/en/find-your-sponsor

More at MassSave.com

masssave.com/cincmr

Commercial Project Teams: Contact Your Electric Company Program Administrator to Start the Process

Kim Cullinane
Eversource
kim.cullinane@eversource.com

Tatsiana Nickinello
Cape Light Compact
tnickinello@capelightcompact.org

Eileen Barrett
National Grid
Eileen.Barrett@nationalgrid.com

Brad Hunter
Unitil
hunterb@unitil.com

Matt Caffrey
Liberty Utilities
matthew.caffrey@libertyutilities.com

Andrew Christofor
Berkshire Gas
achristofor@uinet.com

mass save

Existing Building Retrofit Decarbonization Offerings

WE ARE MASS SAVE®:

BERKSHIRE GAS
An AVANGRID Company

Cape Light Compact

EVERSOURCE

Liberty

nationalgrid

Unitil

Electrification: Heat Pumps

Prescriptive Rebates



Eligible equipment (**must be on QPL**)

- **Air source (air-to-air) heat pumps ($2,500/ton)**
- **Variable refrigerant flow air source heat pumps ($3,500/ton)**
- **Ground source heat pumps ($4,500/ton)**

Eligible Projects

- **< 150 tons, partial or full displacement**
- **Used for space heating and cooling**
- **Existing buildings only**

For more information about heat pumps, please visit www.MassSave.com/ciheatpump

Custom Path



Use custom for…

- **Projects >150 tons**
- **Equipment not covered by prescriptive offer**

Eligibility criteria

- **Must produce net MMBTU reduction**
- **Must NOT increase GHG emissions**
- **Must meet cost-effectiveness criteria**

Scoping study/focused study support offered

Incentives

- **Match prescriptive rates & need pre approval**
- **Are subject to Sponsor budgets and total cost**

Deep Energy Retrofit

Ambitious target: 40% reduction in GHG emissions

- Must include electrification and weatherization
- Relative to existing energy usage
- Sponsors pay 100% of energy assessment and scoping study costs
- Sponsors pay at least 50% of detailed technical assessment study costs

Bonus incentive: $1/ft^2

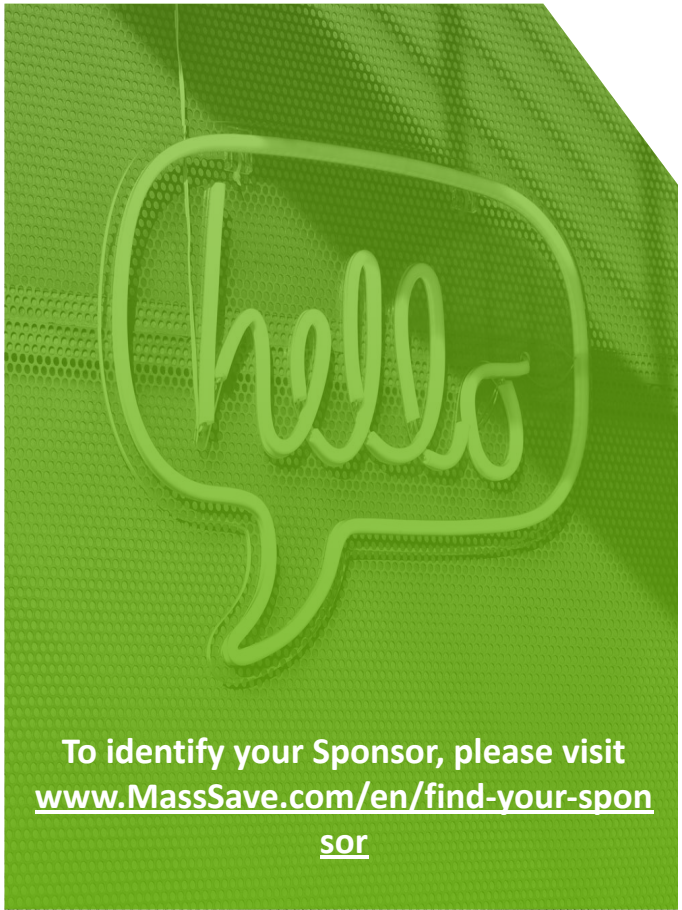
- Sponsors pay incentives as measures are implemented
- Bonus incentive paid after target is reached

3 years to implement

- Sponsors provide implementation plan with milestones and verification requirements

For more information, please visit:
MassSave.com/en/business/programs-and-services/deep-energy-retrofit

Mass Save Existing Building Retrofit Contacts



To identify your Sponsor, please visit www.MassSave.com/en/find-your-sponsor

Fuel Displaced determines Mass Save Sponsor - If displacing natural gas, contact Gas Sponsor; if displacing oil, propane, or electric resistance, contact Electric Sponsor

Ryan Willingham or
Greg Sine
Eversource
ryan.willingham@eversource.com
greg.sine@eversource.com

800-797-6699
Cape Light Compact
efficiency@capelightcompact.org

833-690-1284
National Grid
heatpumpsma@nationalgrid.com

888-301-7700
Unitil
efficiency@unitil.com

508-324-7811
Liberty Utilities
efficiency@libertyutilities.com

800-944-3212
Berkshire Gas
efficiency@berkshiregas.com

Part 2 - Future-proofing your HVAC: Smith College's Geo-exchange System



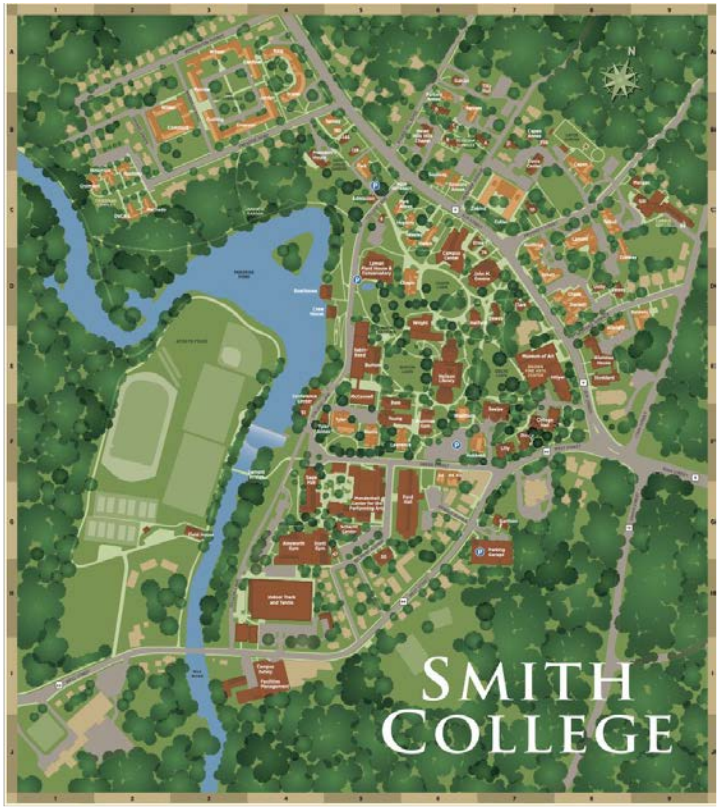
Dr. Alex Barron

SMITH COLLEGE



Smith College Facilities in a Nutshell

- Residential liberal arts college
- ~2500 undergraduate students
- 180 acre campus
- 3.2 million square feet
- ~130 buildings
- ~23,900 metric tons of carbon pollution (equivalent) per year



Key Factors

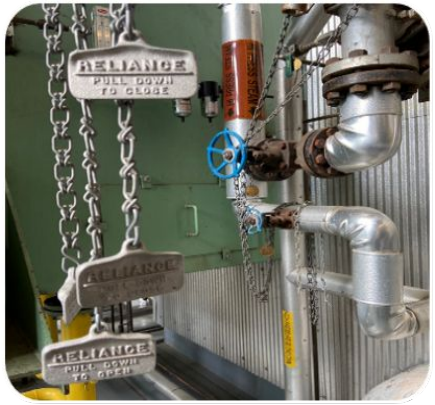
Present:

- Aging steam infrastructure
- Occupant comfort
- Occupant health
- Fossil fuel price volatility

Future:

- Climate policy (State/Federal)
- Hotter weather
- Cleaner electricity
- 2030 climate target









Transition from Gas/Steam to Solar/Heat Pump









Photos: Daniel Foster, Creative Commons, D. Weisbord, Smith Archives, S. Robson, NextEra, NextEra, D. Weisbord, C. Lochner

The New System

Lower cost to operate

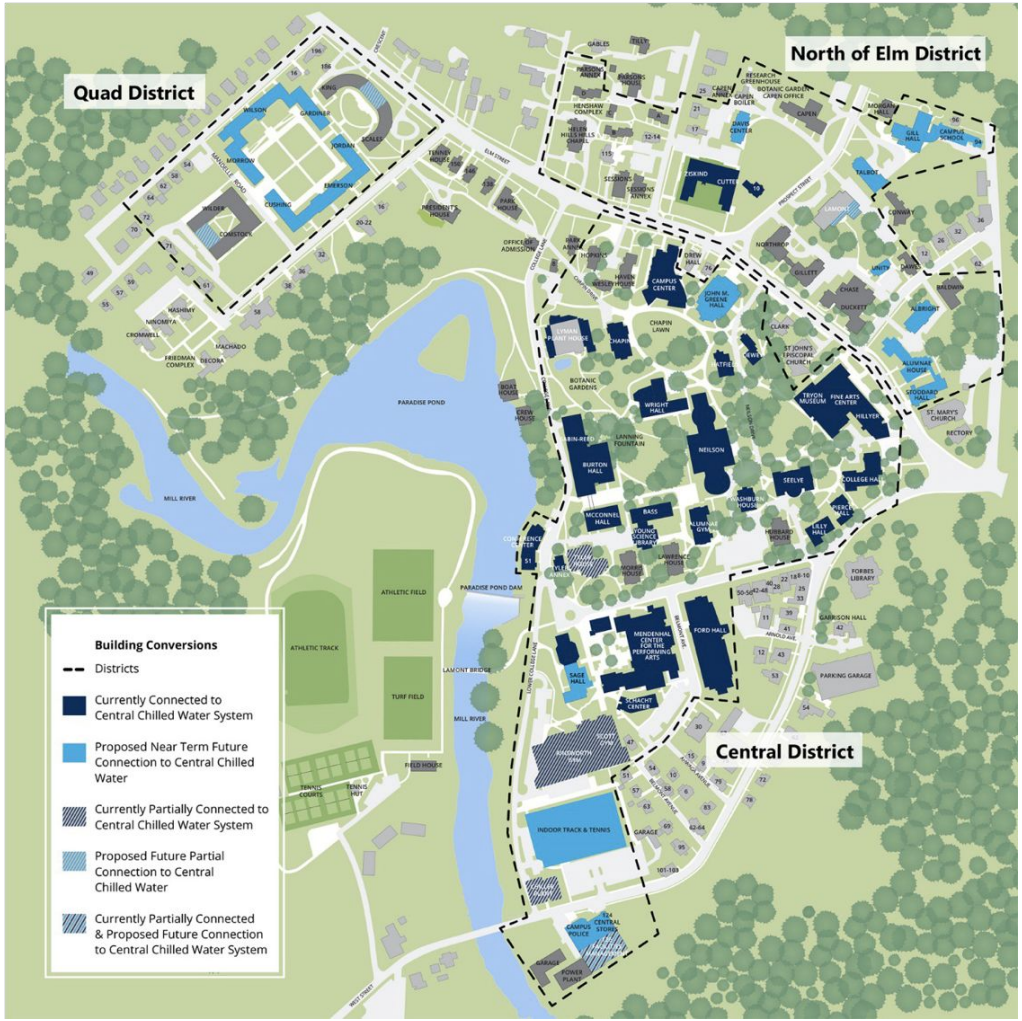
Improved reliability

Improved comfort

Expanded cooling

Greater cost stability

Lower carbon pollution, air pollution, water use



Future-proofing your decisions

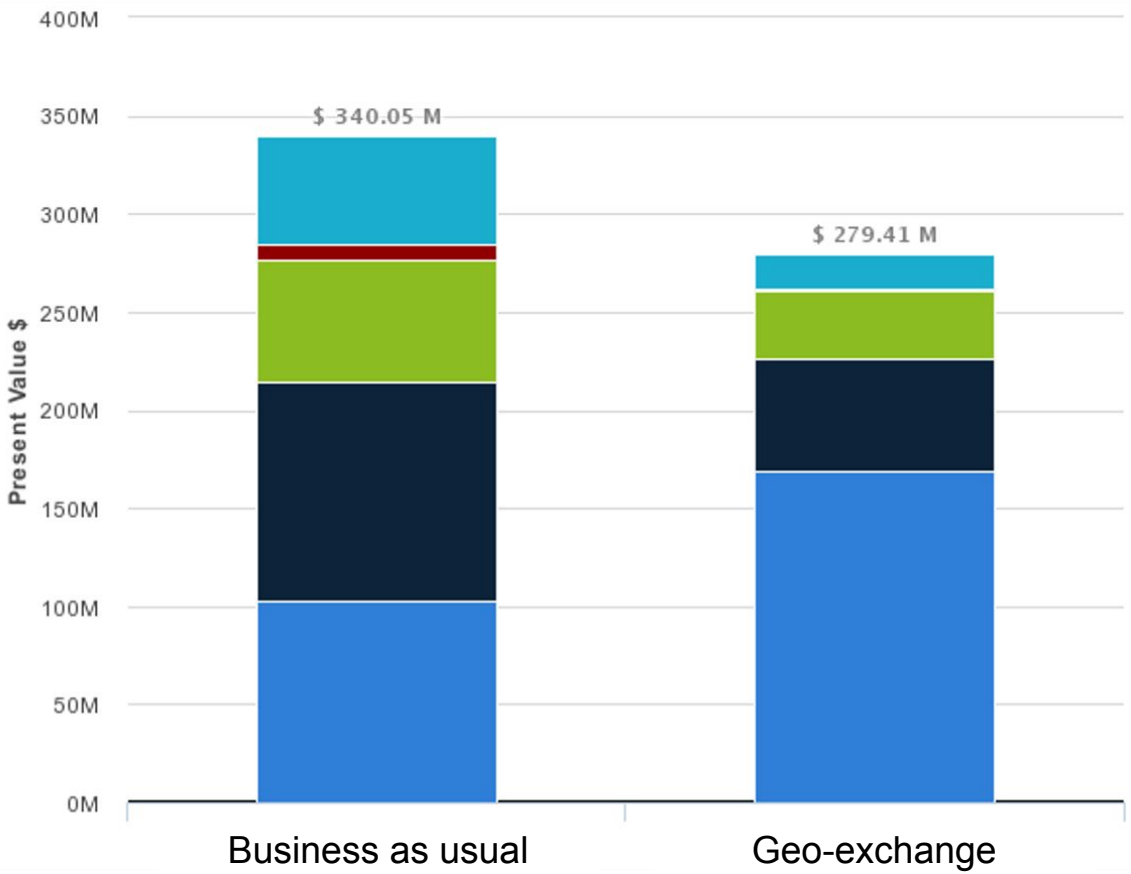
- Think about the full lifecycle costs
- Don’t assume today’s climate policy
- Consider all your benefits

Smith's Approach

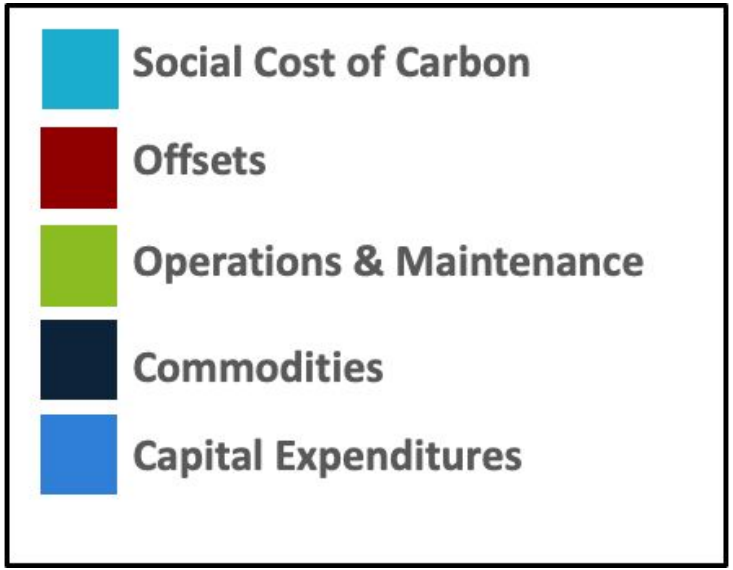
- Life cycle cost analysis (30+ years)
- Include a cost of carbon (~$83/ton CO2 emissions)
  - Proxy for any future state/federal policies that alter economics
    - Boston BERDO Ordinance - Alternate compliance fee $234/ton
    - New York State using $126/ton ($54 to $414)
  - Common practice at Fortune 500 companies
- Track benefits
  - Student comfort/learning
  - Predictable energy costs

Boston Chapter VII, Section 7-2.2
NY DEC Value of Carbon Guidance

Life-cycle Cost Comparison – 30 Year



NOTE: This analysis was performed *before* the Inflation Reduction Act.



For more details: https://smithgeoenergy.info/



Part 3 - Case study: Hopkinton's Elmwood Elementary



Tim Persson

Director of Facilities

HOPKINTON PUBLIC SCHOOLS



Robert Bell, AIA

Principal

PERKINS EASTMAN



Tony Hans, PE

Vice President, Electrical Engineer

CMTA A LEGENCE Company



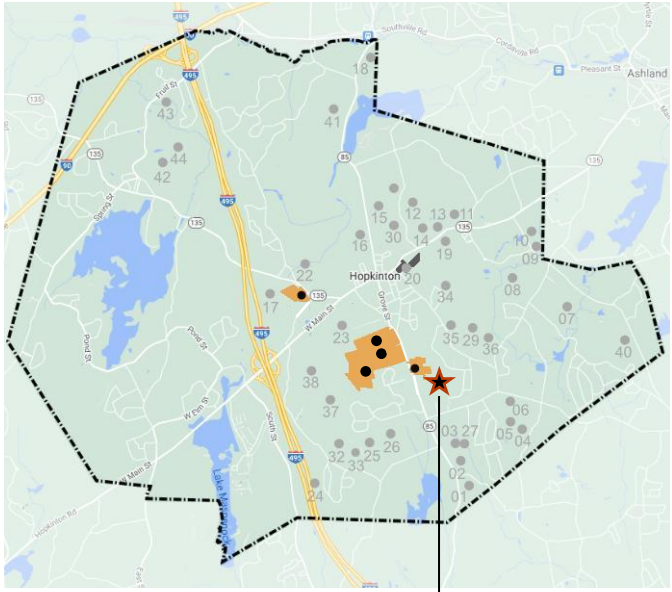
Ben Hobbs, PE

Mechanical Engineer

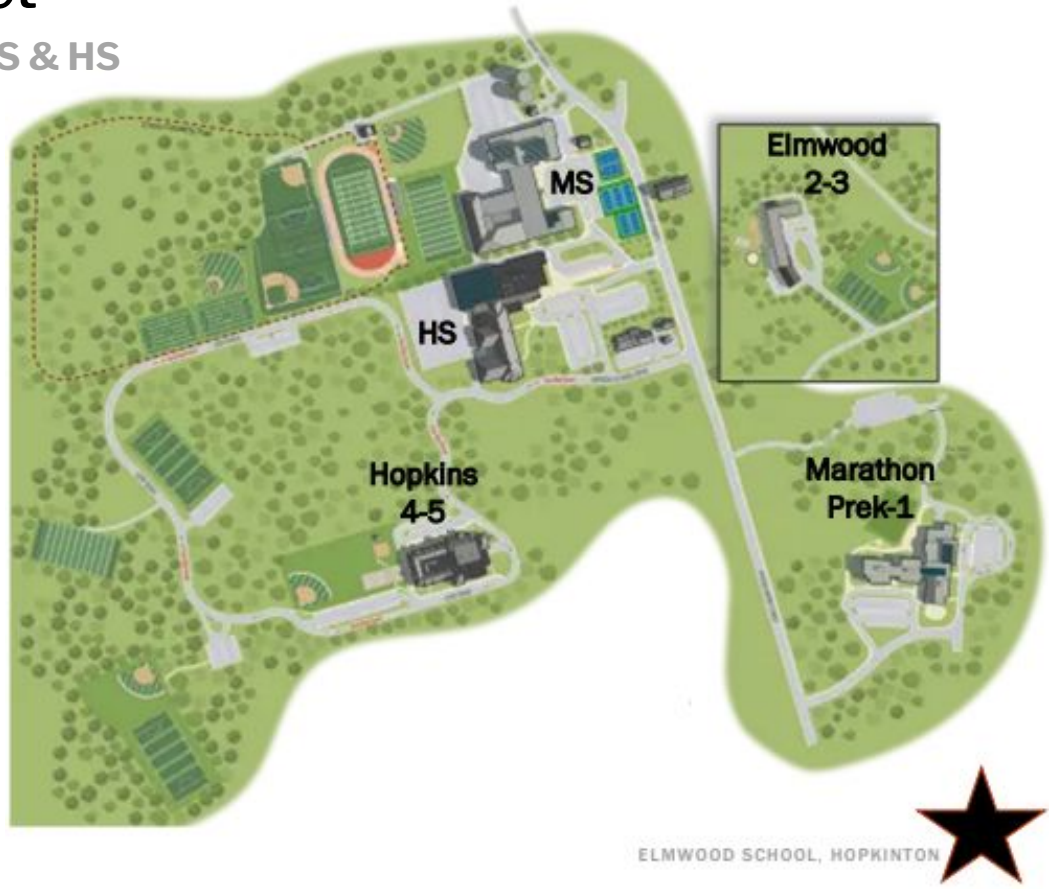
CMTA A LEGENCE Company

Hopkinton School District

MARATHON, ELMWOOD, HOPKINS, MS & HS



Proposed
New Grade 2-4
Elmwood



The Project At Hand







Context for Conversations and Decision Making

Commonwealth of Massachusetts



Report commissioned by the Massachusetts Executive Office of Energy and Environmental Affairs to identify cost-effective and equitable strategies to ensure Massachusetts achieves net-zero greenhouse gas emissions by 2050.

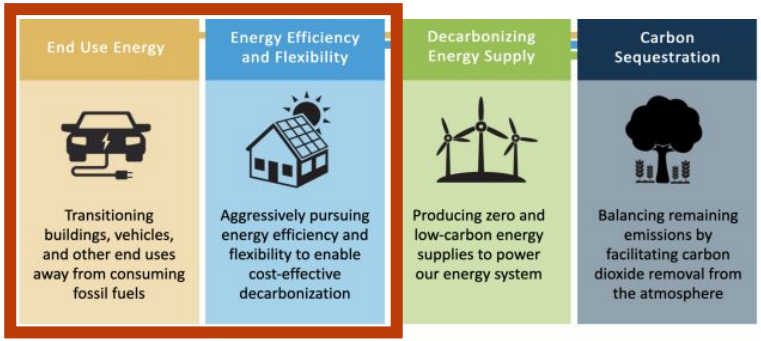
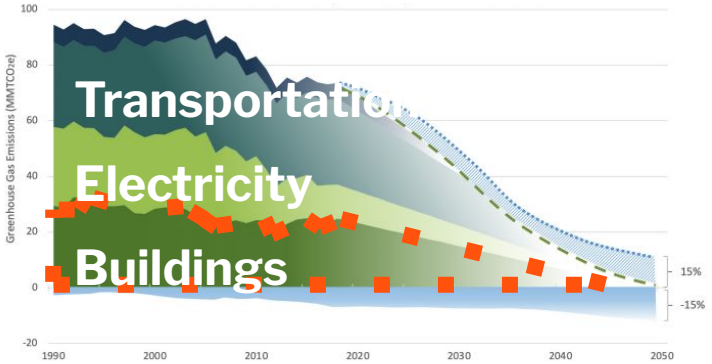


Figure 1. Four key "pillars of decarbonization" for the Commonwealth



HVAC Systems - What is Important to You?

Results from ESBC Meeting 12/13/2022

Higher Priority

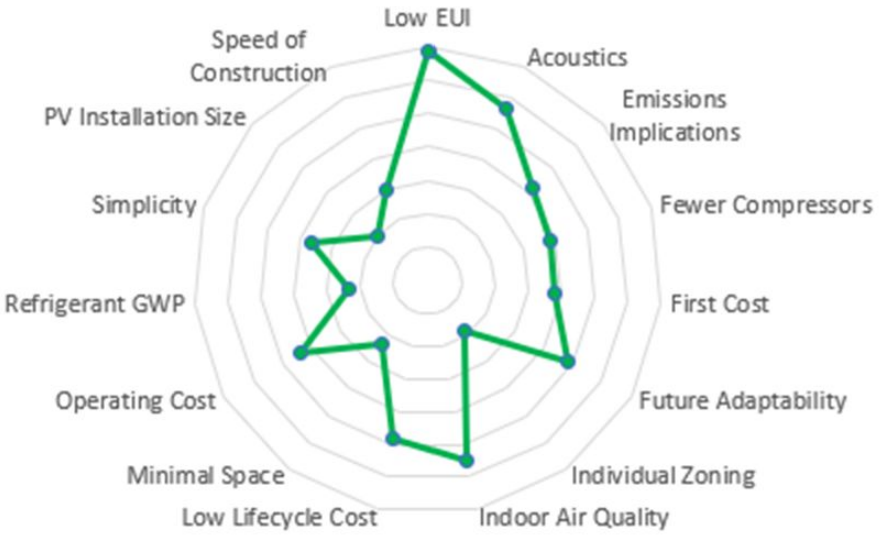
1. **Low EUI**
2. **Acoustics**
3. **Indoor Air Quality**
4. **Lowest Life Cycle**
5. **Future Adaptability**

Medium Priority

1. **Operating Cost**
2. **Emissions Implications**
3. **First Cost**
4. **Fewer Compressors**
5. **Simplicity**

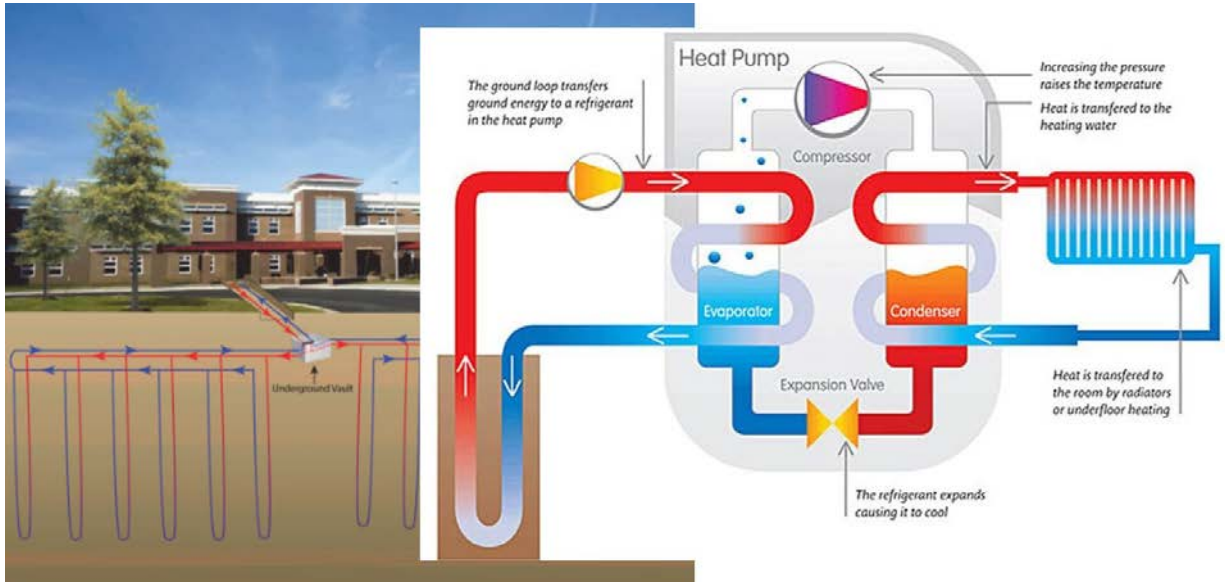
Lower Priority

1. **Speed of Construction**
2. **Refrigerant Global Warming Potential**
3. **Minimal Space**
4. **PV Installation Site**
5. **Individual Zoning**



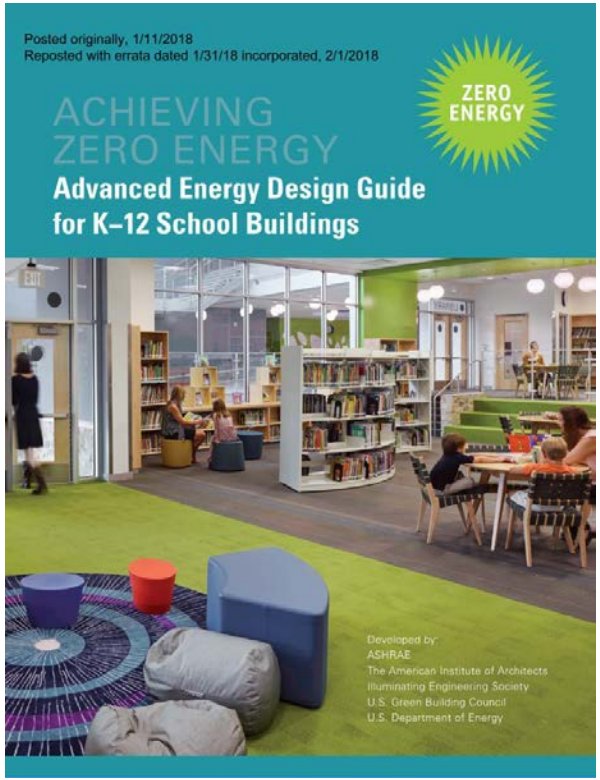
Each circle represents 0.5 point – the closer to the outer ring, the more important

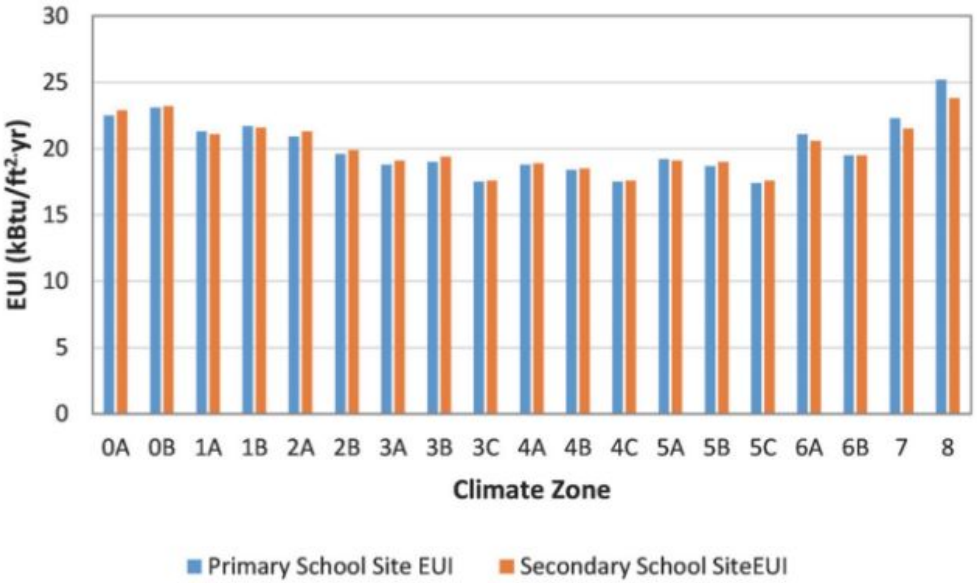
Distributed Ground Source Heat Pumps





Proof is Out There – Advanced Energy Design Guide

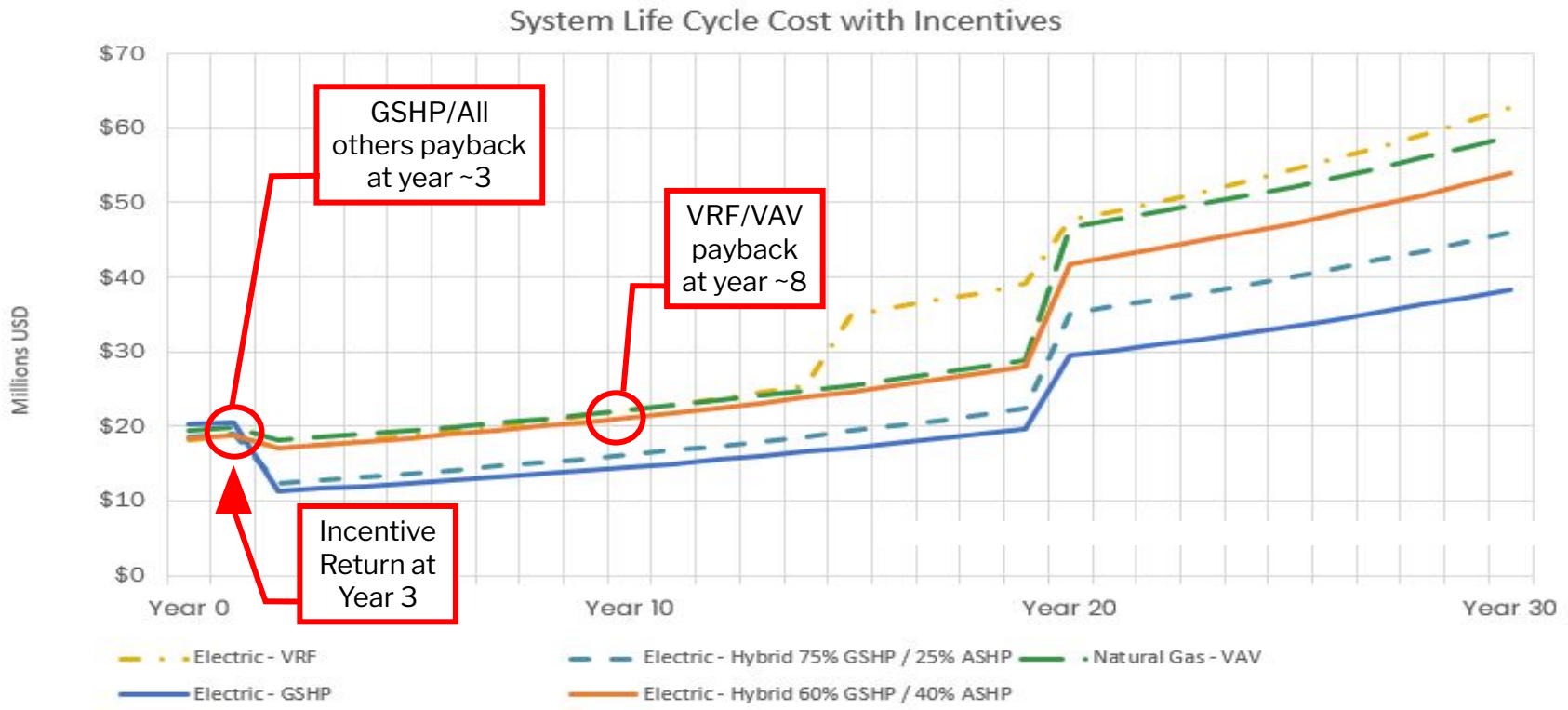




IRA Financial Impact

Elmwood SF	**~175,000 SF**
Construction Budget/SF	**$714/SF**
Construction Budget	**$125,000,000**
HVAC Budget/SF	**$92/SF**
HVAC Budget	**$16,100,000**
IRA %	**34%**
IRA Impact	**$5,474,000**
Mass Save	**$1,700,000**

Life Cycle Cost – with Mass Save & IRA Incentives



Common Questions on the IRA

- Are the IRA incentives real? Is this a grant? Will we definitely receive them?
- When and how will the money come?
- What strategies can we use to cover the upfront costs since funds are only received as a reimbursement?
- What are the domestic content requirements and how do we comply?
- What are the labor provisions and how do we comply?
- How will IRA work within in the context of Mass. public procurement? (equals, labor, apprenticeships, caps, etc.)
- What are the skills / competencies needed to successfully navigate this process? Are tax advisors needed?

Takeaways for today

What's new:

- Incentives are redefining what makes financial sense and what is affordable
- Policy landscape is shifting (quickly!) toward all-electric, zero-emission technologies
- MSBA's new policy governing 3rd-party funding is a big deal (esp. for low-wealth communities)

What to do:

- Continue your learning about the Inflation Reduction Act.
- (Re-)Evaluate every project through the lens of new incentives.
- Build your team. Leverage the leaders.

TELL US

about a school project in your community that will leverage the IRA

Complete this quick form:
https://forms.gle/UYfWVjKLigaL7V8d9

Sara Ross
sara@undauntedk12.org

UNDAUNTEDK12
Climate-resilient schools and future-ready students

QUESTIONS & ANSWERS

For more information:

Kim Cullinane
kim.cullinane@eversource.com

Sara Ross
sara@undauntedk12.org

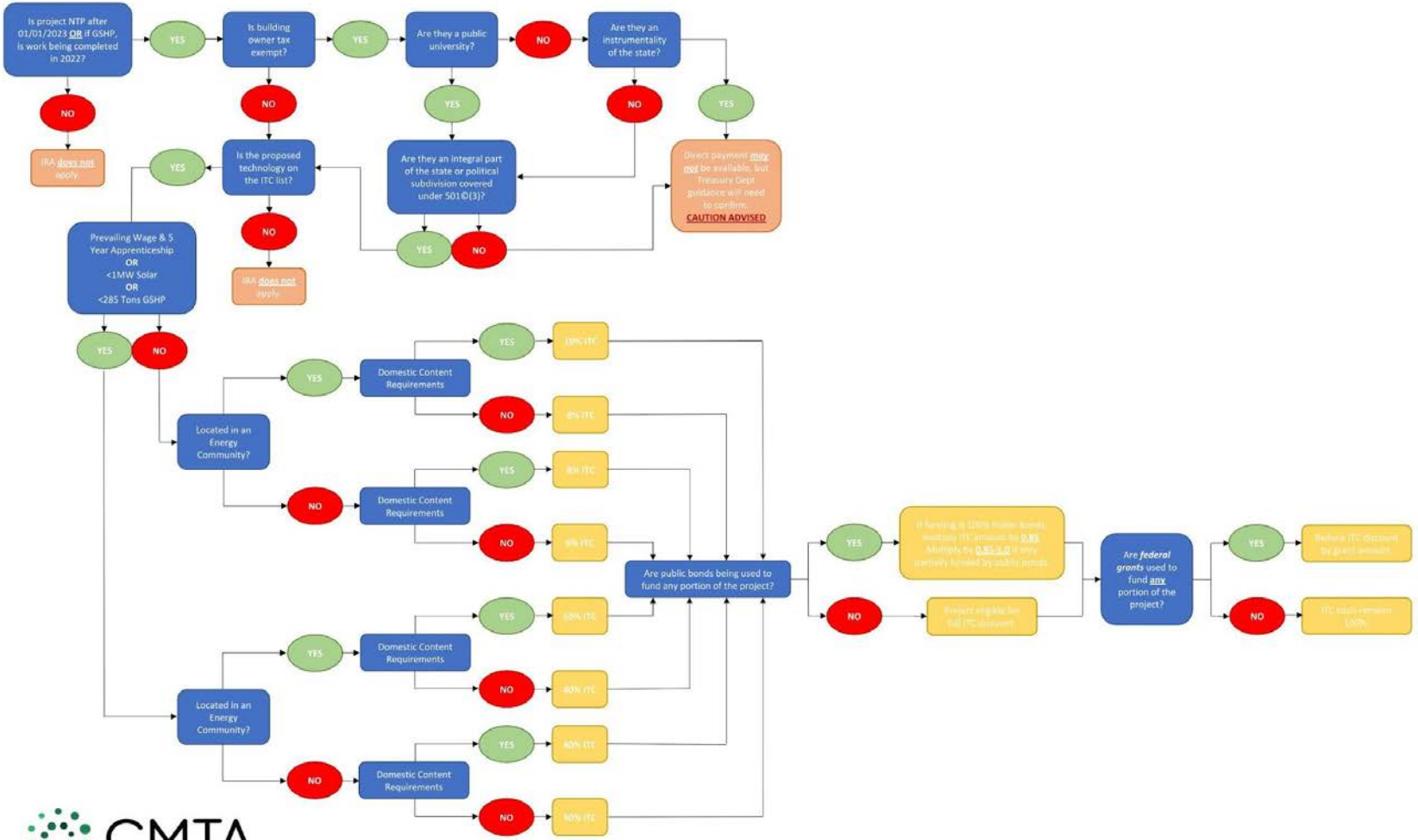
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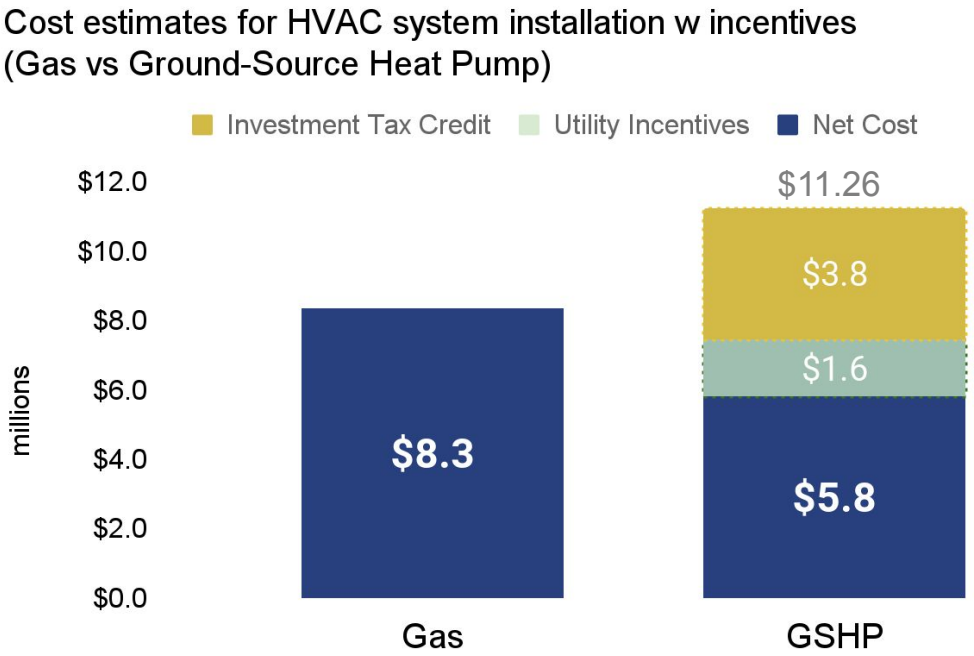
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CMTA
A LEGENCE Company

Fort River Elementary (Amherst, MA)



DeValles Elementary (New Bedford, MA)

HVAC Systems	Initial Costs ($) (w/Incent)	Maint. Costs/Yr ($)	Energy Costs/Yr ($)	Total Operating Costs/Yr ($)	Incentives /Rebates ($)	Inflation Reduction Act (IRA)	Total LCCA w/Rebates
Option 1 – Displacement Ventilation	8,549,120 (8,512,520)	25,647	111,656	137,303	36,600	N/A	10,094,934
Option 2 – Air Cooled Chillers & Boilers	8,549,120 (8,512,520)	28,212	308,372	336,584	36,600	N/A	12,391,661
Option 3 – VRF System	8,014,800 (7,274,208)	47,287	321,035	368,322	740,592	N/A	11,519,129
Option 4 – Air to Water HP Chiller	9,617,760 (9,017,168)	42,746	291,873	334,619	600,592	N/A	12,873,651
Option 5 - Geothermal	13,892,320 (6,092,492)	32,059	285,657	317,717	1,895,592	42.5% Cost of HVAC System (5,904,236)	9,754,185

Source: Presentation by C.A. Crowley to DeValles School Building Committee, August 8, 2023

Central Middle (Greenwich, CT)

FIRST YEAR COST

- PPA PV: assuming $0.08/ kWh (PPA rate may vary depending on the PPA agreement with the vendor).
- PPV Geo: pay 10% of geothermal well costs every year for 25yrs, no escalation /inflation increase.
- In DD, the design team will work to get the system ALT1 baseline pEUI to 25, or below. Doing so will enable the pursuit of full Energize CT incentive rebates.

First Year	Base Case	Alt 1 Geo	Alt 2 VRF	Alt 1 w/PPA PV	Alt 2 w/PPA PV	Alt 1 w/PPA PV & Geo
HVAC Cost	$9.6M	$9.8M	$8.6M	$9.8M	$8.6M	$9.8M
PV Cost	$3.0M	$3.0M	$3.0M	-	-	-
Geothermal Well Cost	-	$3.1M	-	$3.1M	-	-
Geothermal PPA Cost	-	-	-	-	-	$0.3M
pEUI	38.3	27.4	33.7	27.4	33.7	27.4
Net pEUI	17.6	6.7	13.0	6.7 + 20.7 PPA	13.0 + 20.7 PPA	6.7 + 20.7 PPA
Energy Rates	Grid Electricity: $0.16 / kWh Natural gas: $1.04 / therm	Grid Electricity: $0.16 / kWh	Grid Electricity: $0.16 / kWh Natural gas: $1.04 / therm	Grid Electricity: $0.16 / kWh PPA Electricity: $0.08 / kWh	Grid Electricity: $0.16 / kWh PPA Electricity: $0.08 / kWh Natural gas: $1.04 / therm	Grid Electricity: $0.16 / kWh PPA Electricity: $0.08 / kWh
Energy Cost/ SF	$0.16	$0.14	$0.32	$0.71	$0.89	$0.71
Energy Cost	$20,065	$17,557	$40,130	$89,039	$111,612	$89,039
Maintenance Cost (CES)	$22,573	$22,573	$28,217	$22,573	$28,217	$22,573
Total First Year Cost	$12.6M	$15.9M	$11.7M	$13.0M	$8.8M	$10.2M
IRA 40% Geothermal Rebate	-	- $5.2M	-	- $5.2M	-	- $3.9M
Potential Energize CT Incentive	-	- $0.8M	- $0.4M	- $0.8M	- $0.4M	- $0.8M
First Year Net Cost	**$12.6M**	**$9.9M**	**$11.3M**	**$7.0M**	**$8.4M**	**$5.5M**

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Central Middle (Greenwich, CT)

LIFE CYCLE COST ANALYSIS

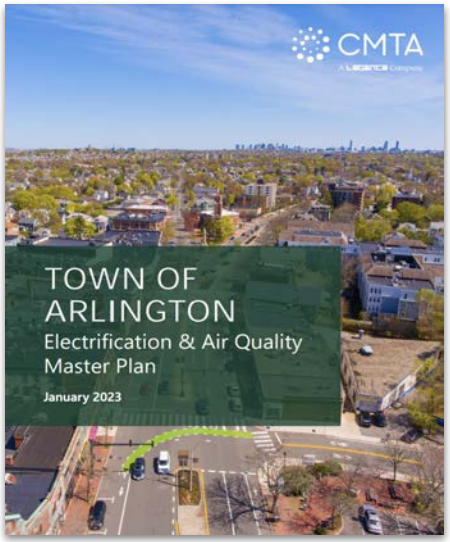
- Escalation Rate: 1.5%
- Inflation Rate: 2.3%
- Nominal Discount Rate: 5.5%
- Real Discount Rate: 3.13%

50 Years	Base Case	Alt 1 Geo	Alt 2 VRF	Alt 1 w/PPA PV	Alt 2 w/PPA PV	Alt 1 w/PPA PV & Geo
HVAC Cost (Turner)	$9.6M	$12.9M	$8.6M	$12.9M	$8.6M	$9.8M
PV Cost	$3.0M	$3.0M	$3.0M	-	-	-
Geothermal PPA Cost	-	-	-	-	-	$7.7M
Energy Costs	$2.9M	$2.5M	$5.8M	$12.8M	$16.M	$12.8M
Maintenance Cost (CES)	$3.2M	$3.2M	$4.1M	$3.2M	$4.1M	$3.2M
Replacement Cost	$26.2M	$25.0M	$65.6M	$17.4M	$58.0M	$17.4M
Potential Rebate	-	-$6.0M	-$0.4M	-$6.0M	-$0.4M	-$4.7M
Total 50yrs Cost	**$45.M**	**$40.7M**	**$86.6M**	**$40.4M**	**$86.3M**	**$46.2M**
Net Present Value (Compares initial investment and return)	-	$3.0M	-$6.9M	$5.4M	-$4.5M	$3.1M

Thornton Tomasetti

GSHP lowest first cost in retrofits, too!

Arlington, MA



See details here

Hadley, MA



See details here

What is Direct Pay (aka Elective Pay)?

The IRS mechanism through which non-taxable entities (like schools!) convert tax credits to cash reimbursements.



https://www.whitehouse.gov/cleanenergy/directpay/

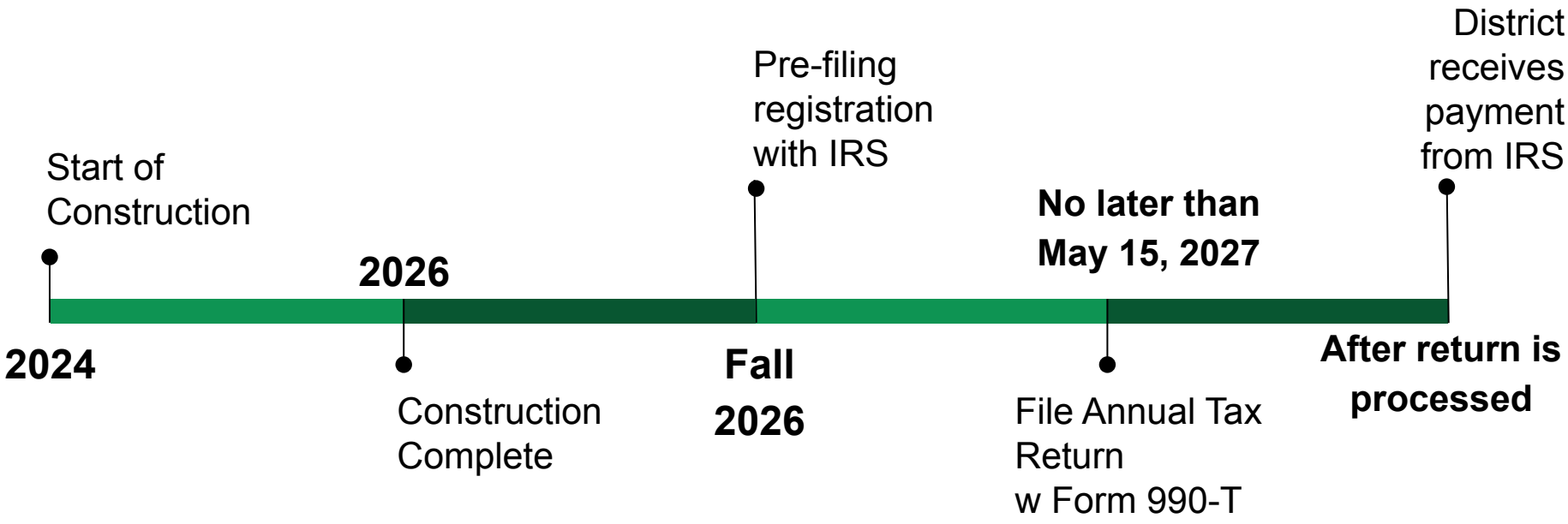


https://www.irs.gov/pub/irs-pdf/p5817.pdf



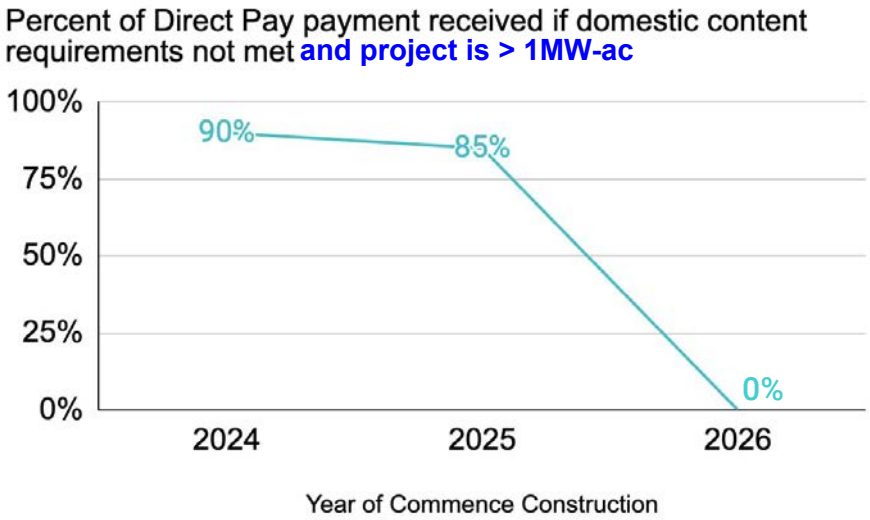
https://www.irs.gov/pub/irs-pdf/p5817e.pdf

When will the school district receive payment?



Domestic content & Direct Pay

For projects over 1MW that commence construction in 2024 or later, meeting the domestic content thresholds will be required to receive the full amount of the credit through Direct Pay.





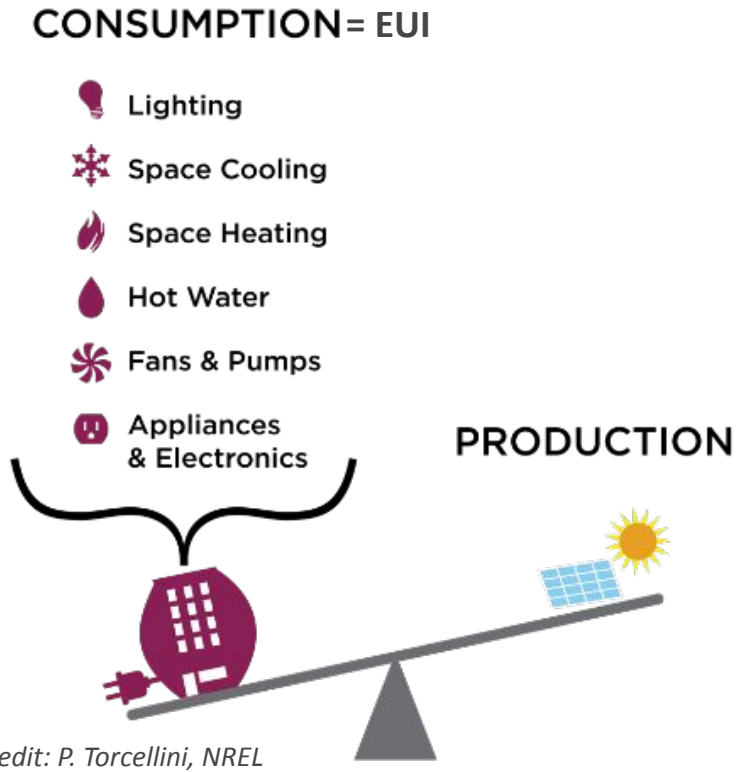
https://www.bluegreenalliance.org/resources/making-clean-energy-tax-credits-deliver-for-the-public-a-user-guide-for-governments-schools-and-nonprofits/

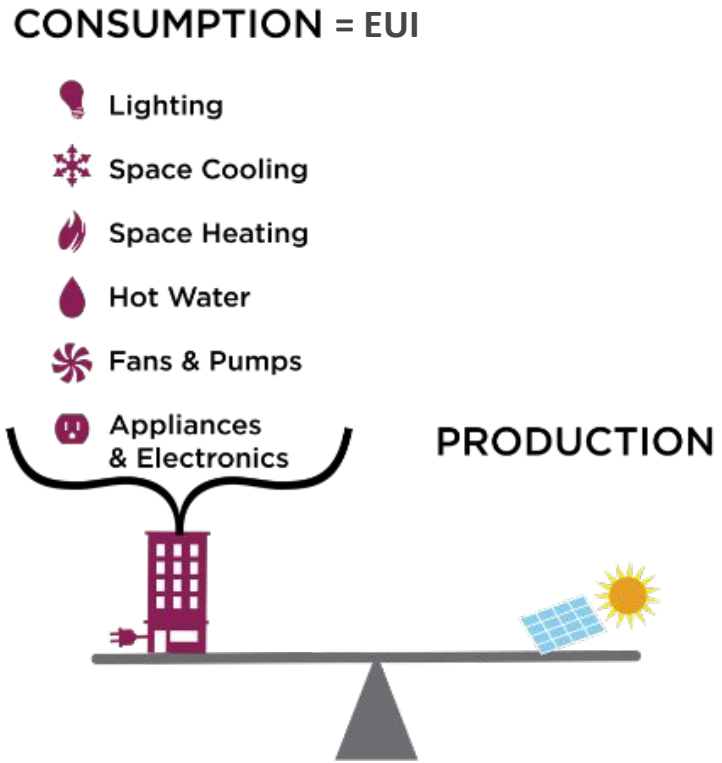
Value of Setting Early EUI Target



Energy Use Intensity (EUI) Review

(Total annual energy use (in kBtu) divided by building SF)





Graphics Credit: P. Torcellini, NREL